June 1999

Mathematics 30
Grade 12 Diploma Examination

Alberta
EDUCATION

Description

Time: 2.5 h. This examination was developed to be completed in 2.5 h; however, you may take an additional 0.5 h to complete the examination.

This is a **closed-book** examination consisting of

- 40 multiple-choice and 9 numerical-response questions, of equal value, worth 70% of the examination

- 3 written-response questions, of equal value, worth 30% of the examination

A tear-out formula sheet and a *z*-score page are included in this booklet.

All graphs on this examination are computer-generated.

Note: *The perforated pages at the back of this booklet may be torn out and used for your rough work.*
No marks *will be given for work done on the tear-out pages.*

Instructions

- You are expected to provide your own scientific calculator.

- Use only an HB pencil for the machine-scored answer sheet.

- Fill in the information required on the answer sheet and the examination booklet as directed by the presiding examiner.

- Read each question carefully.

- Consider all numbers used in the questions to be **exact** numbers and not the result of a measurement.

- If you wish to change an answer, erase **all** traces of your first answer.

- Do not fold the answer sheet.

- The presiding examiner will collect your answer sheet and examination booklet and send them to Alberta Education.

- Now turn this page and read the detailed instructions for answering machine-scored and written-response questions.

Multiple Choice

- Decide which of the choices **best** completes the statement or answers the question.

- Locate that question number on the separate answer sheet provided and fill in the circle that corresponds to your choice.

Example

This examination is for the subject of

A. biology
B. physics
C. chemistry
D. mathematics

Answer Sheet

Ⓐ Ⓑ Ⓒ ●

Numerical Response

- Record your answer on the answer sheet provided by writing it in the boxes and then filling in the corresponding circles.

- If an answer is a value between 0 and 1 (e.g., 0.7), then be sure to record the 0 before the decimal place.

- **Enter the first digit of your answer in the left-hand box and leave any unused boxes blank.**

Examples

Calculation Question and Solution

Correct to the nearest tenth of a radian, $40°$ is equal to _____ rad.

$$40° = 0.6981317008 \ldots \text{ rad}$$
$$= 0.7$$

(Record your answer in the numerical-response section on the answer sheet.)

Record 0.7 on the answer sheet ⟶

| 0 | . | 7 | |

Correct-Order Question and Solution

When the following subjects are arranged in alphabetical order, the order is _____ .

1   biology
2   physics
3   chemistry
4   mathematics

(Record **all four digits** of your answer in the numerical-response section on the answer sheet.)

Answer: 1342

Record 1342 on the answer sheet ⟶ | 1 | 3 | 4 | 2 |

Written Response

- Write your answers in the examination booklet as neatly as possible.

- For full marks, your answers must address **all** aspects of the question.

- Descriptions and/or explanations of concepts must be correct and include pertinent ideas, diagrams, calculations, and formulas.

- Your answers must be presented in a well-organized manner using complete sentences and correct units.

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1. The function $f(x) = x^3 - 6$ is

   A. a linear function
   B. a quadratic function
   C. a polynomial function
   D. an exponential function

Use the following information to answer the next question.

The partial graph of a fifth-degree polynomial function, P, is shown below. All the x-intercepts are integers.
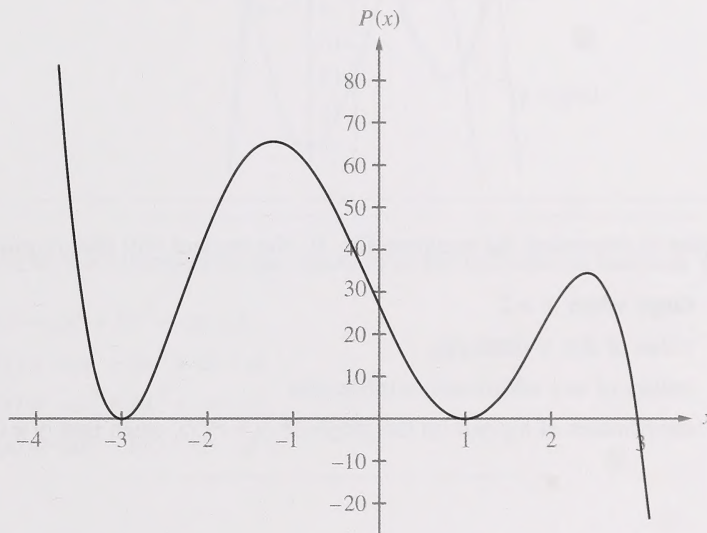
2. The multiplicity of the factor $(x + 3)$ of P is

   A. 1
   B. 2
   C. 3
   D. 5

1

A student is given the partial graph of a third-degree polynomial function, $y = P(x)$, as shown below. The x-intercepts of the graph are -4, 0, and 2.
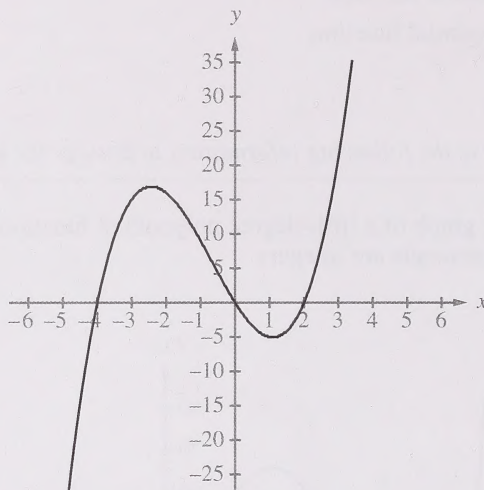
3. In order to determine the equation for P, the student will also require the

A.   range when $x > 2$
B.   value of the y-intercept
C.   values of any additional x-intercepts
D.   coordinates of a point on the graph of $y = P(x)$, such that $y \neq 0$

---

4. A third-degree polynomial function is given by $P(x) = (x - 2)(x + 3)(x + 4)$. If another polynomial function $Q(x) = kP(x)$, $k > 1$, then the graph of $y = Q(x)$ must have

A.   a y-intercept that is less than -24
B.   a y-intercept that is greater than -24
C. k more x-intercepts than the graph of $P(x)$
D. x-intercepts different from those of the graph of $P(x)$

2

The partial graph of the polynomial function $P(x) = ax^3 + bx^2 + cx + d$ is shown below. The graph of $y = Q(x)$ is the reflection of $y = P(x)$ in the x-axis.
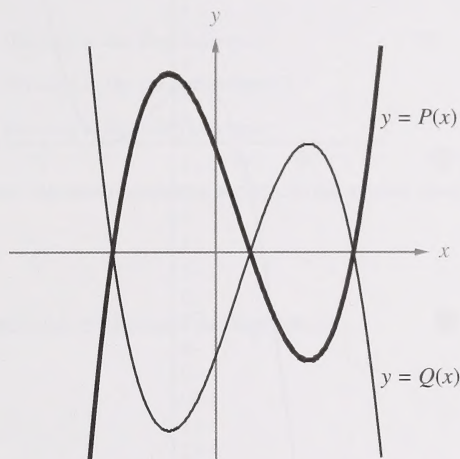
5. According to this information, the equation of the polynomial function Q is

   A. $Q(x) = ax^3 + bx^2 + cx - d$
   B. $Q(x) = -ax^3 + bx^2 + cx + d$
   C. $Q(x) = -ax^3 + bx^2 + cx - d$
   D. $Q(x) = -ax^3 - bx^2 - cx - d$

3

The partial graph of a cubic polynomial function, $y = P(x)$, is shown below.
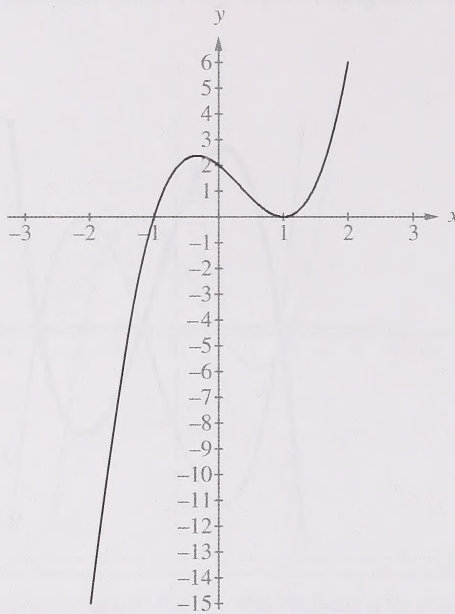
6. When $P(x)$ is divided by $(x + 2)$, the remainder is

    A. negative

    B. zero

    C. positive

    D. undefined

---

7. If the factored form of $3x^3 - 2x^2 - 17x - 12$ is $(x - 3)(x + 1)(ax + b)$, then $(ax + b)$ is

    A. $3x - 4$

    B. $3x + 4$

    C. $-3x + 4$

    D. $-3x - 4$

4

1. The polynomial function $P(x) = 4x^3 - 18x^2 - x - 45$ is divided by $D(x) = x - 5$. The quotient is of the form $Q(x) = ax^2 + bx + c$. Determine the values of a, b, and c, where a, b, and $c \in N$.

a is _____ (Record in the first column.)

b is _____ (Record in the second column.)

c is _____ (Record in the third column.)

(Record your answer in the numerical-response section on the answer sheet.)

8. An angle of $\dfrac{13\pi}{90}$ radians, expressed in degrees, is

A. 52°

B. 39°

C. 26°

D. 13°

9. If $2 \sin\theta \cos\theta - \cos\theta = 0$, $0 \le \theta < 2\pi$, then the values of θ are

A. $0, \dfrac{\pi}{3}, \pi,$ and $\dfrac{5\pi}{3}$

B. $0, \dfrac{\pi}{3}, \dfrac{5\pi}{6},$ and $\dfrac{3\pi}{2}$

C. $\dfrac{\pi}{6}, \dfrac{\pi}{2}, \pi,$ and $\dfrac{5\pi}{3}$

D. $\dfrac{\pi}{6}, \dfrac{\pi}{2}, \dfrac{5\pi}{6},$ and $\dfrac{3\pi}{2}$

5

10. A student is investigating the effects of changing the values of the parameters a, b, c, and d in the equation $y = a \sin[b(\theta + c)] + d$. The graph of each of the following functions is plotted:

$$f(\theta) = \sin\theta$$
$$g(\theta) = 2\sin\theta$$
$$h(\theta) = \sin2\theta$$
$$k(\theta) = \sin(\theta + 2)$$
$$l(\theta) = \sin\theta + 2$$

The equation whose graph will have the same θ-intercepts as the graph of $y = f(\theta)$ is

A. $y = g(\theta)$
B. $y = h(\theta)$
C. $y = k(\theta)$
D. $y = l(\theta)$

11. An equivalent expression for $\cos\left(\dfrac{3\theta}{2}\right)\cos\left(\dfrac{\theta}{2}\right) + \sin\left(\dfrac{3\theta}{2}\right)\sin\left(\dfrac{\theta}{2}\right)$ is

A. $\sin(2\theta)$
B. $\cos(2\theta)$
C. $\sin(\theta)$
D. $\cos(\theta)$

12. An equivalent expression for $\dfrac{(\sin x)(\cos x)}{\tan x}$ is

A. $\sin^2x$
B. $\sin x$
C. $\cos^2x$
D. $\cos x$

13. If $(\pi, -6)$ satisfies the equation $h(\theta) = A \sin\left(\theta + \dfrac{\pi}{2}\right) - 4$, then the value of A is

    A.   10
    B.   6
    C.   4
    D.   2

Numerical Response

2. An arc of a circle with a radius of 100 cm subtends a central angle of 1.4 radians. The length of the arc, correct to the nearest centimetre, is _____ cm.

(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer the next question.

The partial graph of the function $f(\theta) = a \sin(\theta + c) + d$ is shown below.
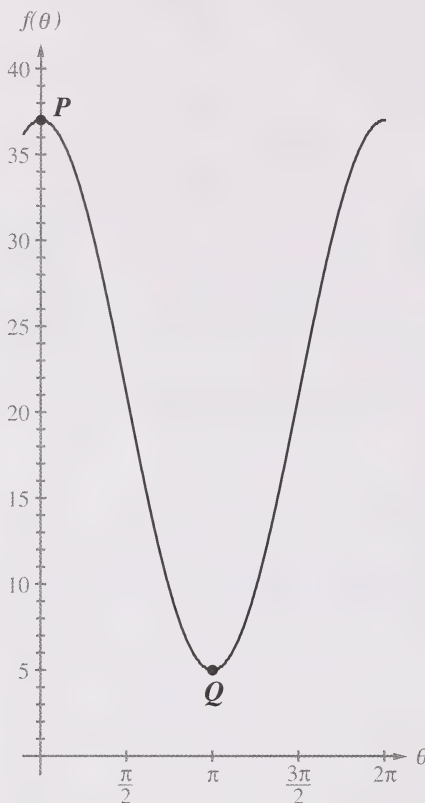
The graph has a maximum at $P(0, 37)$ and a minimum at $Q(\pi, 5)$.

3. Based on the information above, the value of d, correct to the nearest whole number, is _____.

(Record your answer in the numerical-response section on the answer sheet.)

14. Given that $\log_b 64 = \dfrac{3}{2}$, the value of b is

    A.   16

    B. $42\dfrac{2}{3}$

    C.   96

    D.   512

15. If $\log_5(125x) = 25$, then the value of x is

    A. 5^{28}

    B. 5^{22}

    C. $5^{\frac{25}{3}}$

    D.   5

16. A student wants to use a graphing calculator to graph $y = \log_5 x$. If the calculator accepts only common logarithms, then an equivalent equation that could be used to obtain the graph is

A. $y = \dfrac{\log x}{\log 5}$

B. $y = \log x - \log 5$

C. $y = 5 \log x$

D. $y = \dfrac{\log x}{5}$

Use the following information to answer the next question.

Half-life of Phosphorus-32

$$A(t) = A_0 \left(\frac{1}{2} \right)^{\frac{t}{h}}, \text{ where}$$

$A(t)$ = the mass present at time t

A_0 = $A(0)$

t = time

h = half-life of phosphorus-32

17. The half-life of phosphorus-32 is 14.3 days. The length of time that it will take 96.2 g of phosphorus-32 to decay to 12.5 g, to the nearest day, is

A. 8 days

B. 26 days

C. 42 days

D. 52 days

10

The partial graphs of $f(x) = 1 + 3 \log_2 x$ and $g(x) = 4 - \log_2 x$ are shown below. The graphs intersect at point A.
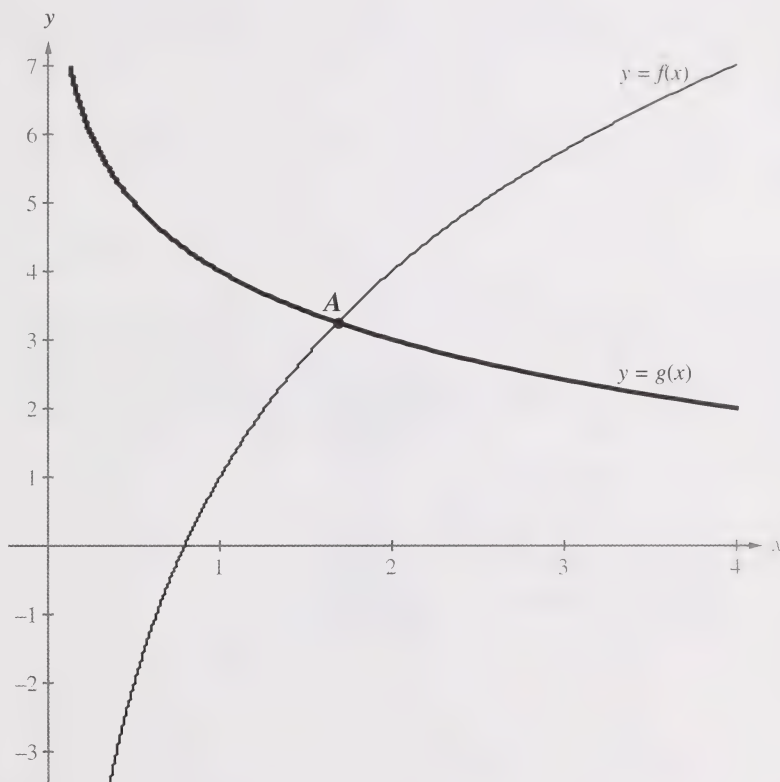
18. Based on the information above, the x-coordinate of point A can be determined by solving

A. $3 \log_2 x + 1 = 0$

B. $4 - \log_2 x = 0$

C. $\log_2 x = \dfrac{5}{2}$

D. $\log_2 x = \dfrac{3}{4}$

19. If $\log_2 b = c$, then $\log_4 b$ equals

A. $\dfrac{c}{2}$

B. c^2

C. $2c$

D. $\sqrt{c}$

20. The lead concentration of human blood, C_B, measured in $\mu g/100$ mL, increases with the mean lead concentration of the environmental air to which a person is exposed, C_L, measured in $\mu g/m^3$, according to the formula $C_B = 60 \log C_L - 20$. If the lead concentration of samples of environmental air has values between 5.0 and 100.0 $\mu g/m^3$, then the range of lead content in human blood is

A. 21.9 to 100.0 $\mu g/100$ mL
B. 20.0 to 60.0 $\mu g/100$ mL
C. 2.6 to 100.0 $\mu g/100$ mL
D. 2.1 to 6.0 $\mu g/100$ mL

4. An exponential function f is defined by $f(x) = 7(1.5)^{x-6}$. If $f(k) = 91$, then the value of k, correct to the nearest tenth, is _____.

(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer the next question.

Four different planes, labelled plane 1, 2, 3, and 4, intersect a double-napped cone, as shown below.
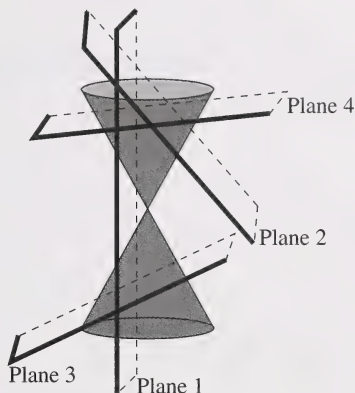
21. Of the conics formed, the one with the smallest eccentricity is formed by the intersection of the cone and

A. plane 1
B. plane 2
C. plane 3
D. plane 4

The graph of the relation $Ax^2 + Cy^2 - 36 = 0$ is shown below.
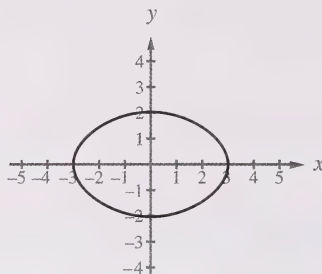
22. The coefficients A and C are interchanged and the resulting relation is graphed. The graph is

A.

B.

C.

D.
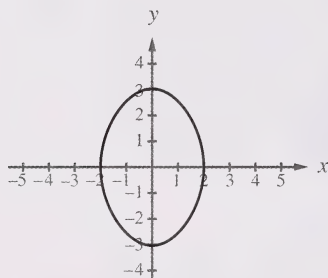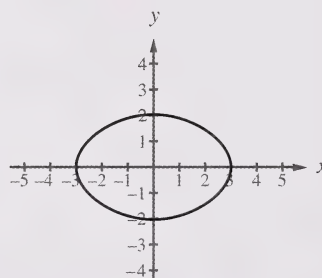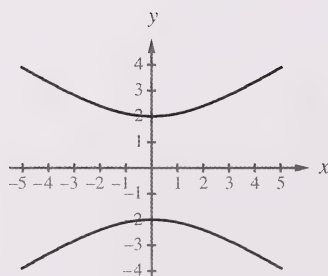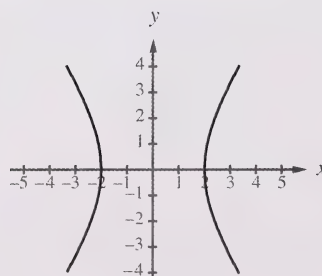
The parabola with vertex at $(0, 0)$ is shown below.
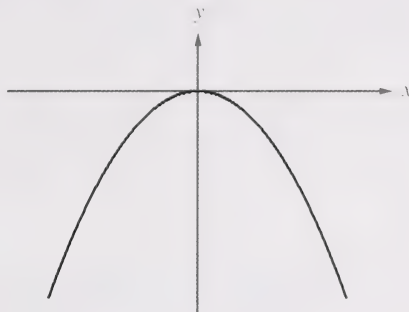
23. The graph above is formed by the equation $Ax^2 + Cy^2 + Dx + Ey + F = 0$ where one or more of the parameters A, C, D, E, and F must be zero. How many parameters are zero?

    A.   1 parameter

    B.   2 parameters

    C.   3 parameters

    D.   4 parameters

A rectangular rug measuring 4 m × 3 m is stained in one corner. The rug is to be cut to elliptical shape to eliminate the stain. To mark the cutting line for the ellipse, a person tacks the ends of a piece of string to the rug in two places. When the string is pulled taut, it is 4 m long.

The person traces the ellipse with a piece of chalk and finds that the chalk line does not fit on the rectangular rug, as shown in diagram 1. After changing her setup, she traced a new ellipse that fits perfectly inside the rug, as shown in diagram 2.

Diagram 1

Piece of chalk | String

Stain

3 m

4 m

Chalk line

Diagram 2

Stain

3 m

4 m
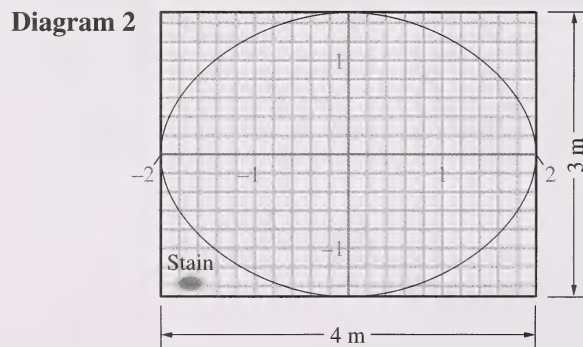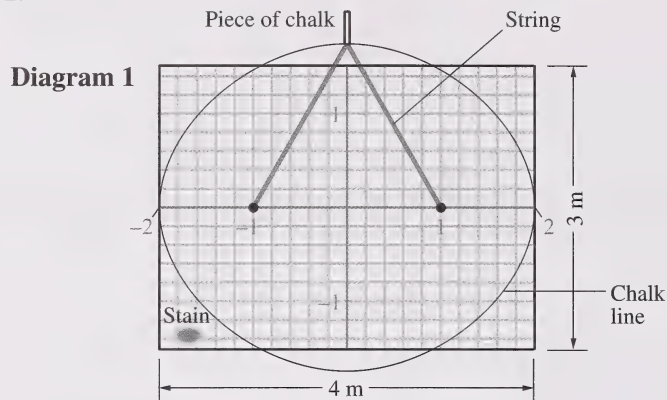
24. What change to the setup did the person make to ensure that the ellipse fits perfectly inside the rectangular rug?

A. The string was shortened.

B. The string was lengthened.

C. The tacks were moved farther apart.

D. The tacks were moved closer together.

25. The foci of a hyperbola are $F_1(-5, 0)$ and $F_2(5, 0)$. If point $(-3, 0)$ lies on the graph of the hyperbola, then the value of $\left| \overline{PF_1} - \overline{PF_2} \right|$, where P is any point on the graph of the hyperbola, is

A. 4
B. 6
C. 10
D. 16

Use the following information to answer the next question.

A drawing of the cross section of the stadium roof is a semiellipse with foci at F_1 and F_2, as shown below. The distance from F_2 to point P at the end of the longest axis is 8 m.
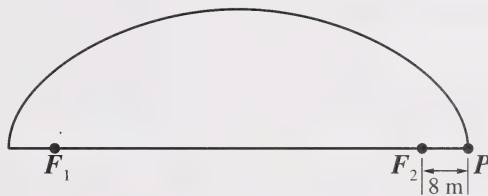
26. If the ellipse has an eccentricity of $\dfrac{4}{5}$, then the distance from point P to the nearest directrix, correct to the nearest metre, is

A. 5 m
B. 8 m
C. 9 m
D. 10 m

5. The graph of a hyperbola has the equation $9x^2 - 16y^2 - 180x + 756 = 0$.
The value of the largest y-intercept, correct to the nearest tenth, is _____.

(Record your answer in the numerical-response section on the answer sheet.)

27. In a geometric sequence, the first term is $\dfrac{2}{81}$ and the sixth term is $\dfrac{3}{16}$.
The common ratio for this geometric sequence is

A. $\dfrac{2}{3}$

B. $\dfrac{3}{2}$

C. 2

D. 3

28. The third term, t_3, of the sequence defined by $t_1 = 2$, $t_n = 2^{t_{n-1}}$, $n > 1$, $n \in N$ is

A. 4
B. 6
C. 8
D. 16

A chain letter begins when one person sends a letter to several people. Each recipient then sends a copy of the letter to a specified number of his or her friends.

In 1935, such a chain letter was received by almost every person in the city of Denver. This particular chain letter was started by a person who sent it to five people ("link" 1), each of whom sent it to five more people ("link" 2), and so on.

29. Assume that no person received the letter twice and that each person who received the letter carried out the instructions to send it to five more people in Denver. Knowing that the chain letter was received by almost everyone in the city of Denver after 8 links in the chain, the population of Denver could be estimated by calculating

A. $5(5)^7$

B. $1 + 7(5)$

C. $\dfrac{5(5^8 - 1)}{5 - 1}$

D. $\dfrac{8[2(1) + (7)(5)]}{2}$

30. Which of the following sums has the **largest** value?

A. $\displaystyle\sum_{k=1}^{100} (k+2)$

B. $\displaystyle\sum_{k=1}^{100} 2k$

C. $\displaystyle\sum_{k=1}^{100} 2^k$

D. $\displaystyle\sum_{k=1}^{100} \left(\frac{1}{2}\right)^k$

31. A graduation committee is organizing the graduation banquet. The catering fee consists of a fixed cost and a cost per person. The total cost can be written as an arithmetic sequence, where n is the number of people attending the banquet. If the total cost for 100 people is c dollars and the total cost for 200 people is k dollars, then the common difference of the sequence is

A. $\dfrac{200k - 100c}{200}$

B. $\dfrac{100k - 200c}{200}$

C. $\dfrac{k - c}{200}$

D. $\dfrac{k - c}{100}$

32. If the sum of the first n terms of a sequence is $S_n = 3n^2$, $n \in N$, then the general term of the sequence is

    A. $t_n = 3n^2 - 3(n-1)^2$, $n \in N$
    B. $t_n = 3(n+1)^2 - 3(n)^2$, $n \in N$
    C. $t_n = 3(n-1)^2$, $n \in N$
    D. $t_n = 3(n+1)^2$, $n \in N$

Numerical Response

6. If the general term of a sequence is $t_n = 2n + 3$, where $n \in N$, then the sum of the first 20 terms, S_{20}, is _____.

(Record your answer in the numerical-response section on the answer sheet.)

33. A hockey arena has seating that is divided into sections lettered from A to Z inclusive and AA to XX inclusive. Each section consists of 20 rows with 16 seats in each row. At a sold-out hockey game, it is announced that a prize will be given to a person sitting in Section JJ. If you are sitting in section JJ, then what is the probability that you will win the prize?

    A. $\dfrac{1}{50}$

    B. $\dfrac{1}{320}$

    C. $\dfrac{1}{16\,000}$

    D. $\dfrac{1}{16\,640}$

34. For a certain college program, a student must take an English course. The student must also take any 4 of the following courses: Mathematics, Chemistry, Physics, Psychology, Biology, and French. The number of possible 5-course programs that a student could take to complete this program is

A. $_6C_4$
B. $_7C_5$
C. $_6P_4$
D. $_7P_5$

35. If $_nP_r = 3\ 024$ and $_nC_r = 126$, then the value of r is

A. 4
B. 6
C. 9
D. 24

36. A university student is doing research on birth order and gender in families with 2, 3, and 4 children. Each family is designated by a code, which is assigned based on the number of children, their birth order, and their sex. For example, the code MFM is given to families with 3 children where the first- and last-born children are male and the middle child is female. If the student needs a code for families with 2 children, 3 children, and 4 children, then what is the maximum number of possible codes?

A. 12 codes
B. 16 codes
C. 24 codes
D. 28 codes

37. In the expansion of $(x + 2y)^8$, the numerical coefficient of the term containing x^4y^4 is

A.   70

B.   140

C.   560

D.   1 120

7. An airline company requires flight attendants to wear a pair of slacks, a shirt, a tie, and a blazer. The flight attendants have a choice of 3 different pairs of slacks, 5 different shirts, 4 different ties, and 2 different blazers. The maximum number of different outfits that a flight attendant could create using the items provided is _____ outfits.

(Record your answer in the numerical-response section on the answer sheet.)

8. The **difference** between the number of arrangements using all of the letters in **FACTOR** and the number of arrangements using all of the letters in **DIVIDE** is _____.

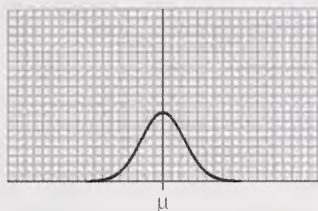(Record your answer in the numerical-response section on the answer sheet.)

38. Cases of apples delivered to a grocery store have a mean mass of 20 kg with a standard deviation of 0.8 kg. Assuming a normal distribution, the probability of choosing, at random, a case with a mass between 19.0 kg and 21.2 kg is

A. 0.8664

B. 0.8276

C. 0.7888

D. 0.4970

39. A teacher gave a class a physics test. The test scores were normally distributed and had a mean of 40% with a standard deviation of 10%. Dan received a mark of 65% on his test. The teacher adjusted the mean of the test to 60% and adjusted the standard deviation to 14%. If the teacher kept Dan's z-score constant, then what would Dan's new mark be?

A. 85%

B. 93%

C. 95%

D. 98%

40. The manufacturer of "Greenline" lawnmowers gathers information on how soon after purchase the mowers require their first repair. The data is normally distributed with a mean of 7.5 years and a standard deviation of 2 years. If 35 000 "Greenline" mowers are sold in one year, then the number of those "Greenline" mowers expected to require repairs in the first 5 years is

A. 3 696 mowers

B. 13 804 mowers

C. 21 196 mowers

D. 31 304 mowers

The graphs of four normal distributions are shown below. The graphs are drawn using the same scale.

1

μ

2

μ

3

μ

4

μ
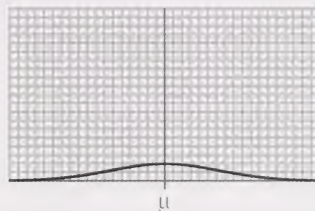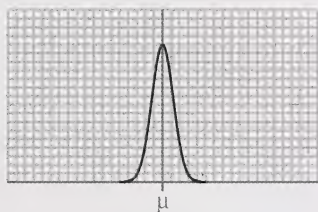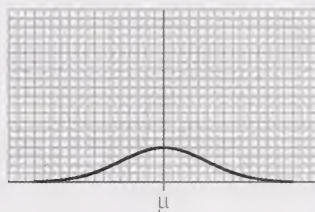
Numerical Response

9. These graphs, listed in order of **increasing** standard deviation, are
_____ , _____ , _____ , and _____ .
smallest   largest

(Record your answer in the numerical-response section on the answer sheet.)

A sports store is planning a sales promotion of mountain bikes. Each day that a bike remains unsold, the price will be discounted by 2% of the previous day's price. The table below gives the successive daily prices of a mountain bike with an original price of $1 224.49.

Day	Bike Price
1	$1 200.00
2	$1 176.00
3	$1 152.48
4	$1 129.43
5	$1 106.84

Written Response—10%

1. Successive daily prices of the mountain bike can be approximated by using the recursive formula $t_1 = \$1\,200.00$ and $t_{n+1} = 0.98t_n$.

   • Determine the price of the mountain bike on day 8 of this sales promotion.

- Write an expression for t_n as a function of n, $n \in N$.

- The store will lose money on the mountain bike if its price falls below $600. On which day of the promotion will this occur?

Owners of vehicles in North America are required to purchase licence plates. In Alberta, standard licence plates consist of 3 letters followed by 3 digits.

Written Response—10%

2. • Determine the maximum number of different standard licence plates available. State any assumption(s) that you make.

• Using the same assumptions that you stated above, determine the probability that you would receive **MRF 456** if you were randomly issued a standard licence plate.

- Assume that it becomes necessary to increase the number of available licence plates. Provide two alternative proposals in which a maximum of 6 characters, consisting of letters and/or digits, can be used. In your explanation, include any assumptions you make and determine the number of licence plates for each proposal.

Use the following information to answer the next question.

A mathematics class was asked to solve the equation

$$3^{x+2} = 6^x$$

The attempts of two students to solve the equation are shown below. Each student made one error that led to an incorrect solution.

Student A	**Student B**
$3^{x+2} = 6^x$	$3^{x+2} = 6^x$
$3^{x+2} = 3^{2x}$	$\log 3^{x+2} = \log 6^x$
$x + 2 = 2x$	$x + 2 \log 3 = x \log 6$
$2 = 2x - x$	$2 \log 3 = -x + x \log 6$
$x = 2$	$2 \log 3 = x(-1 + \log 6)$
	$\dfrac{2\log 3}{(-1 + \log 6)} = x$
	x is approximately -4.3

Written Response—10%

3. • Show that neither $x = 2$ nor $x = -4.3$ satisfies the equation $3^{x+2} = 6^x$.

- Identify the error that was made by each student and state why each error leads to an incorrect answer.

- Algebraically solve the equation $3^{x+2} = 6^x$ and give the solution, correct to the nearest hundredth.

You have now completed the examination.
If you have time, you may wish to check your answers.

Mathematics 30 Formula Sheet

The following information may be useful in writing this examination.

- The roots of the quadratic equation $ax^2 + bx + c = 0$ are

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- The distance between two points (x_1, y_1) and (x_2, y_2) is

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Quadratic Relations

- $e = \dfrac{|PF|}{|PD|}$

Trigonometry

- arc length $a = r\theta$

- $\sin^2 A + \cos^2 A = 1$

- $1 + \tan^2 A = \sec^2 A$

- $1 + \cot^2 A = \csc^2 A$

- $\sin(A + B) = \sin A \cos B + \cos A \sin B$

- $\sin(A - B) = \sin A \cos B - \cos A \sin B$

- $\csc A = \dfrac{1}{\sin A}$

- $\sec A = \dfrac{1}{\cos A}$

- $\cot A = \dfrac{\cos A}{\sin A}$

- $\cos(A + B) = \cos A \cos B - \sin A \sin B$

- $\cos(A - B) = \cos A \cos B + \sin A \sin B$

Permutations and Combinations

- $_nP_r = \dfrac{n!}{(n - r)!}$

- $_nC_r = \dfrac{n!}{r!(n - r)!}$

- In the expansion of $(x + y)^n$, the general term is $t_{k+1} = {_nC_k}\, x^{n-k} y^k$

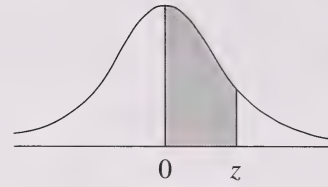### Sequences and Series

- $t_n = a + (n - 1)d$

- $S_n = \dfrac{n[2a + (n - 1)d]}{2}$

- $S_n = n\left(\dfrac{a + t_n}{2}\right)$

- $t_n = ar^{n-1}$

- $S_n = \dfrac{a(r^n - 1)}{r - 1}$, $r \neq 1$

- $S_n = \dfrac{rt_n - a}{r - 1}$, $r \neq 1$

Exponential and Logarithmic Functions

- $\log_a mn = \log_a m + \log_a n$

- $\log_a \dfrac{m}{n} = \log_a m - \log_a n$

- $\log_a m^n = n \log_a m$

Areas under the Standard Normal Curve

$$z = \frac{x - \mu}{\sigma}$$

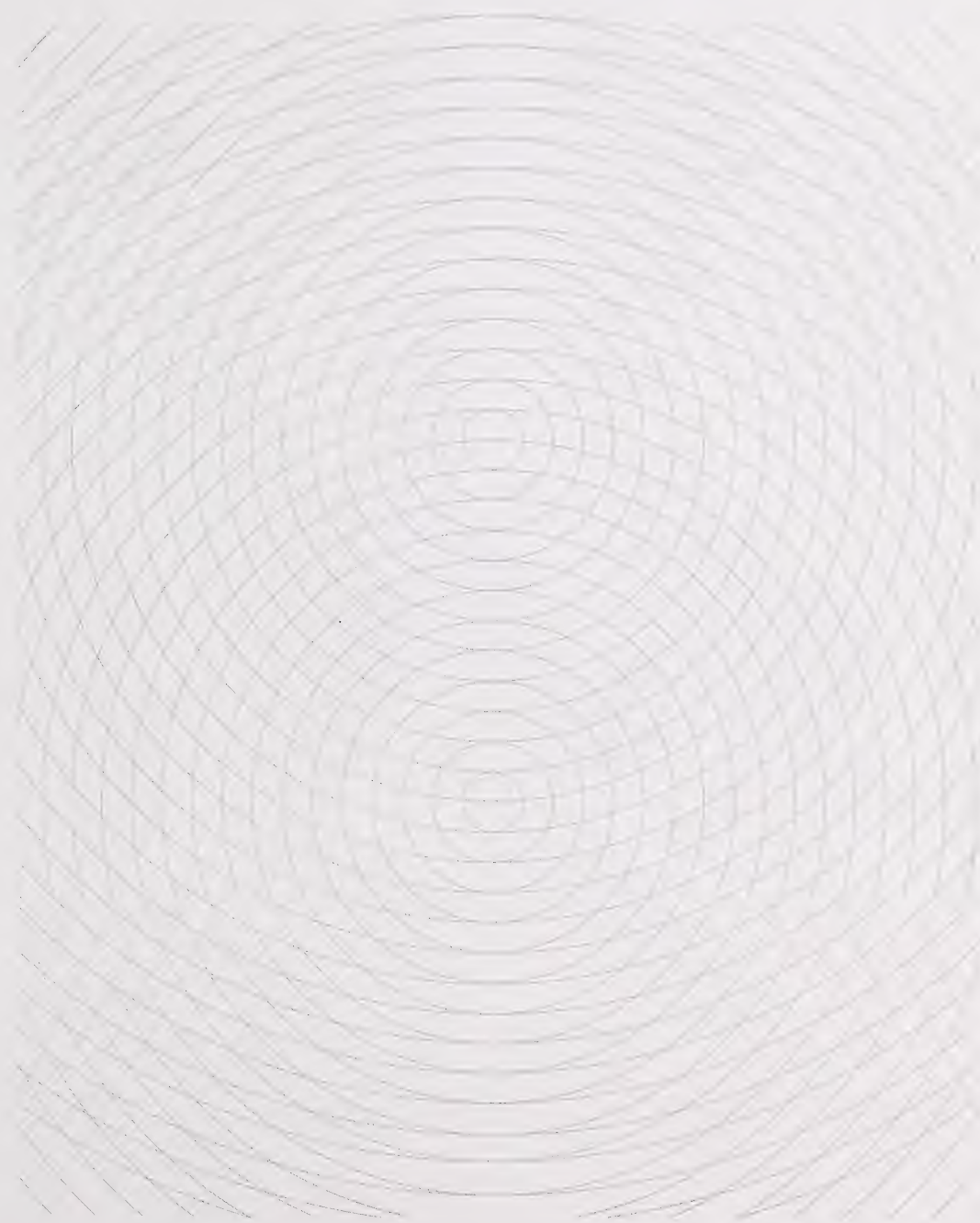| z	0	1	2	3	4	5	6	7	8	9
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0754
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2258	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2518	0.2549
0.7	0.2580	0.2612	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2996	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.7	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.8	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.9	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000

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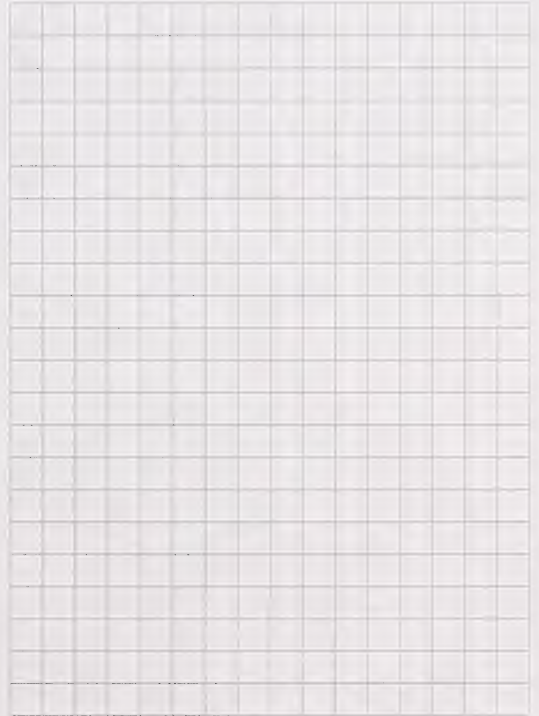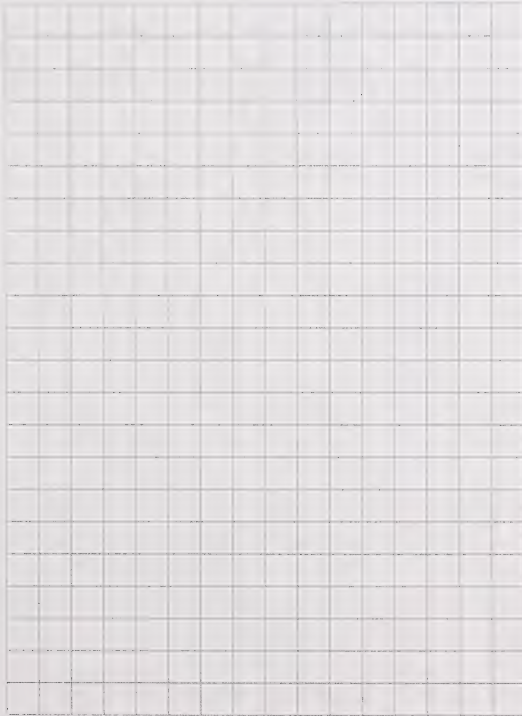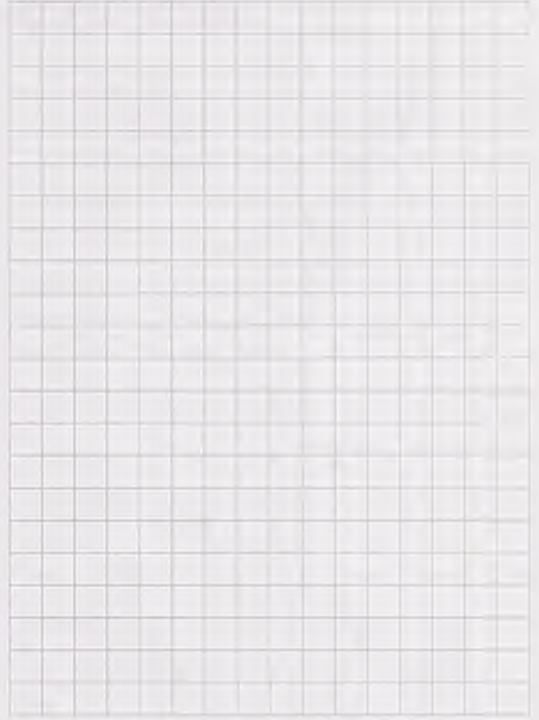
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Mathematics 30

June 1999

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